The Voice Coil

October 2020
Our 101th Year
Volume 58, Issue 10

Website:
http://www.mvara.org/

The Voice Coil
Newsletter of the Mahoning Valley Amateur Radio Association
Established 1919

Prez Sez

I received an interesting phone call on the club phone line the other day. This woman started out with "Oh my God, Thank you for answering the phone. You have no idea how many Ham Radio Clubs I have tried to call and email and you're the first one to answer the phone."

I replied, "Your welcome. What can I do to help you?" She stated and did not stop for the next 15 minutes.

She said, "I'm having problems with the electrical system in my house. In one part of the house everything is ok, everything works like it should. But in this other room that is an addition to the house I have gone through 4 TVs . I turn the TV on and within 20 minutes the picture gets distorted and shuts off."

She then tells me how she went out and bought a DVD player and plugged it and 20 minutes later it did the same thing. I questioned how she knew it was the DVD player when she was hooking it to a known TV with a problem. She saw my point.

She then started with she has this ham radio friend and he looked it up and the guy that lives next store was a ham radio operator and he moved in a year ago and she now was convinced he was the the problem. Now I figure this ham radio operator that she knows that told her about this neighbor knows just enough to be dangerous to this neighbor ham. As we talked or as she talked I found that this ham radio friend told her about repeaters because she told me, "She was sure that he was running one of those repeaters over there and it was causing a problem on her TVs and I have been through 4 of them."

I asked her if there were any antennas in the air and she didn't know. I then told her that was not how repeaters worked and there was not one in the area that was handling that kind of traffic.

(continued pg.

Next Meeting:

October 9, 2020
GOP Headquarters, 8381 Market St., Boardman, OH 44512

2019 Officers

President: Scott Wilton, KE4UHC
Vice President: Dave Brett, KD8NZF
Secretary: Mike Malarky, W8IWD
Treasurer: Nancy Brett, KD8QNY
Trustees: Dean DeMain, W8YSU
Bryan Bartzi, KF8G
Jerry Goddard, KC8EFO
Mike McCleery, K8PRR

Newsletter Editor: Mark Haverstock, K8MSH

Awards Manager: Dave Fairbanks, N8NB, 330.759.6993, 4770 Logan Ave. Youngstown, OH 44505

The Mahoning Valley Amateur Radio Association, Inc, meets the second Thursday of every month. Location and time are subject to change. Dues are $20.00 per year, $10.00 each for additional family member. Contact Nancy, kd8qny@zoominternet.net for membership details.

The club call is **W8QLY**; equipment operated under this call includes a two meter voice repeater at 146.745 (-600, 110.9 PL). Club email: mvara.w8qly@gmail.com

MONDAY NIGHT NET operates every Monday at 9:00. PM on 146.745 MHz.

SKYWARN NET - First Wednesday of the month at 8:30 PM on 146.745 MHz as weather warrants.

ARES NET- First and third Mondays of each month at 8:30 PM on 146.745 MHz; prior to the Monday Night Net.

Asheville Radio Museum

Our October MVARA meeting program will be a virtual tour of the Asheville Radio Museum.

Located on the campus of the Asheville - Buncombe Tech Community in Asheville, NC. The Asheville Radio Museum is owned and operated by the Southern Appalachian Radio Museum, Inc., a 501 (c) (3) non-profit corporation and is sponsored by QCWA Chapter 145.

Opened to the public in 2001 by a small group of amateur radio operators, it has evolved from being a collection into a teaching museum, where people of all ages can learn about the history of radio technology and wonder at the equipment and how it evolved. Their mission is:

- To foster an understanding of the technology and history of amateur and commercial radio development and an appreciation of the impact this has had.
- By collecting and preserving radio equipment, advertising and other memorabilia, in an education-oriented museum, with hands-on displays and a working ham station
- And, through outreach, offering education programs and tours for interested students.
- In doing so, stimulate student interest in science, technology and engineering (STEM).

The museum is home to more than 50 transmitters and receivers, beginning with an early 1900 spark gap transmitter for Morse code. There is also a working ham station where the public can see how hams can work through the internet and even contact the international space station!

License Refresher Answers:
E1D01 (A) [97.3]
E1D02 (A) [97.211(b)]
G4B01 (D)
G4B02 (D

Current Activities

October 9: Monthly Meeting 7pm, GOP Headquarters, 8381 Market St, Boardman, OH 44512. Program: A virtual tour of the Asheville Radio Museum.

Elections: Nominations are open for a couple of offices Vice President, Treasurer, and 2 trustees. Give me a call to nominate your buddy. Who knows maybe he will take the job! Call me at: 330-333-2761 or drop me an email at: mvara.w8qly@gmail.com. Nominations are open until October 14th.

JOTA: If you could come out for a few hours and run a radio for the kids that would be a big help. Date is Saturday October 13th at Camp Stambaugh

Contact Us:

Email: mvara.W8QLY@gmail.com **Snail-mail:** MVARA, P.O. Box 14141, Poland, OH 44514

Meeting ideas/ suggestions? Contact Dave, KD8NZF, KD8NZF@zoominternet.net

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Hamfest Calendar

11/01/2020 Massillon Hamfest Sponsor: Massillon Amateur Radio Club **Location:** Miliary Air Preservation Society Hanger 5383 Massillon Road (Rt 241), Green, OH 44232.
Website: http://www.w8np.org **Talk-In:** 147.18 (PL 110.9) **Public Contact:** Terry Russ , N8ATZ 3420 Briardale Ave NW Massillon, OH 44646 Phone: 330-833-3091 **Email:** truss@sssnet.com

Swap and Shop

--Analyzer [RIG EXPERT] AA-55 Zoom w/mnl

--K44 CW Keyboard & Reader w/mnl, pwr sup, ps-keyboard, & wired-plugs.

2m station:

--KENWOOOD 281a 2M transceiver w/manual
--RT SYSTEM prog. software w/USB cable & CD
--ASTRON RS-20a power supply
--RG58au 50-ft. cable w/conn.
--ARROW OSJ146/440 J-Pole

Contact Ken, KC8Y cct66000@gmail.com

Prez Sez, continued

I finally got her to stop so that I could talk to her and I carefully explained how ham radio worked, "If this neighbor ham even had radios set up it, probably wasn't him being the problem as he left the house from time to time and had to sleep. You cannot operate your station unless your physically sitting in front of it." I asked her, "Have you ever met this neighbor?"

She said, "No."

I told her, "If it was him causing the problem he would have to fix the problem." She seemed very pleased with that. But I continued, "But why don't you pick up a 6 pack or a bottle of wine and go over and knock on his door and ask him if he is running any radios, Maybe he will give you a close-up view of ham radio." She thanked me and asked if she could keep our number and maybe call back again I said, "Sure anytime."

Scott, KE4UHC

Can You Repeat That Again??

How many times have you had to ask somebody to repeat their callsign because they said it so fast? More than a few, I bet. And there most likely have been times where somebody asked us to repeat ours because of the same reason.

Sometimes it might be necessary when you're trying to join a QSO where nobody is leaving any gaps (hint, hint) but how about the times when you key up with your callsign just to let people know you're on the air? You know your callsign but that doesn't mean everybody else does, even when you are using a local repeater. And since we seem to be having some new hams on the local repeaters saying your callsign slower makes it easier for everybody. And if you are one of the newbies, welcome to the hobby.

Saying your callsign slower will help everybody get to know you faster. (Using phonetics can also be a big help.) This is also true for everybody when checking into a net. Not only is it easier for Net Control to hear your callsign, it also makes it easier to write down everybody's callsign. Being a Net Control myself, I know firsthand about that. This is also true on the HF bands where static and poor signals can make it hard to hear somebody's callsign. So slow down & take it easy – one small way to being a good ham radio operator.

Ham Humor: HAM RADIO Q&A

Got ham radio questions? We've got answers of some sort! Our crack team of researchers* have been collecting your questions, with answers below.
Researchers could mean one or any of the following: PhD students, our plumber or no-code Technicians.

What's the best frequency to operate on 40 meters? Sincerely, New Op.
Dear New Op, probably a couple times a week! 73!

I want to erect a dipole with two 82 foot legs on my 100 foot lot. Any suggestions? Sincerely, Land Locked.
Dear Land Locked, buy a vertical! 73!

Newly licensed Technician here! I got this sharp Yaesu VX-3R HT and it works great into the local VHF repeater. Thing is, these guys are kinda boring. Is this the best ham radio has to offer? With hope, Bored to Silence
Dear Silence, it's the best we have. You might try buying more radios, to make yourself feel better, like us. 73!

I got a Baofeng UV5R for my wife. How did I do? Thanks, Betrothed in Bedford.
Dear Betrothed, sounds like a good trade! 73!

My neighbor says my new off-center-fed dipole is ugly. What should I do? Sincerely, Sensitive Receive.
Dear Sensitive, We heard your neighbor said your hair was ugly, too. Going to the barber tonight? Of course not! Carry on, OM! 73!

I've always wanted to be a policeman. Sometimes I walk outside and yell 'UP! UP! UP!' at cars. Where do I apply? Thanks, Brainless in Seattle.
Dear Brainless, Sounds like you're already on the job! Now go to the lower end of 20m phone and get those DX chasers transmitting UP where they belong! 73!

--Hamhijinks

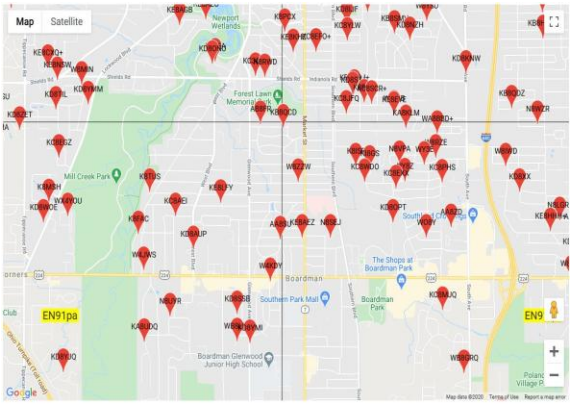
Elon Musk Installs New Repeater

Part of the mission of the recent SpaceX launch was to deliver a new repeater for the International Space Station. The IORS (InterOperable Radio System) was launched from Kennedy Space Center on March 6, 2020, on board the SpaceX CRS-20 resupply mission. It consists of a special, space-modified JVC Kenwood D710GA transceiver, an ARISS developed multi-voltage power supply, and interconnecting cables.

The design, development, fabrication, testing, and launch of the first IORS was an incredible five-year engineering achievement accomplished by the ARISS hardware volunteer team. It will enable new, exciting capabilities for ham radio operators, students, and the general public. Capabilities include a higher power radio, voice repeater, digital packet radio (APRS) capabilities, and a Kenwood VC-H1 slow-scan television (SSTV) system.

The initial operation of the new radio system is in FM cross-band repeater mode using an uplink frequency of 145.99 MHz with an access tone of 67 Hz and a downlink frequency of 437.800 MHz. The voice repeater is sensitive enough and uses a power level that will enable folks with an HT and a whip antenna to make contacts using the ISS when its close to the horizon. It should also be easy to make contacts using mobile rigs that can support cross-band operation as well. Program your radios!

No Matter Where You Go, There You Are



This is not the first website for finding Hams on a map – QRZ has done it for years. But this one is well done and very easy to use. Allows a simple search by callsign, grid square, zip code, or street address. Look yourself up:

https://haminfo.tetranz.com/map

Amateur License Refresher

It's probably been awhile since you took your Amateur License exam. Here are a few sample questions from the current question pools just to keep those synapses firing.

Extra Pool

E1D01
What is the definition of telemetry?
A. One-way transmission of measurements at a distance from the measuring instrument
B. Two-way transmissions in excess of 1000 feet
C. Two-way transmissions of data
D. One-way transmission that initiates, modifies, or terminates the functions of a device at a distance

E1D02
Which of the following may transmit special codes intended to obscure the meaning of messages?
A. Telecommand signals from a space telecommand station
B. Data containing personal information
C. Auxiliary relay links carrying repeater audio
D. Binary control characters

General Pool

G4B01
What item of test equipment contains horizontal and vertical channel amplifiers?
A. An ohmmeter
B. A signal generator
C. An ammeter
D. An oscilloscope

G4B02
Which of the following is an advantage of an oscilloscope versus a digital voltmeter?
A. An oscilloscope uses less power
B. Complex impedances can be easily measured
C. Input impedance is much lower
D. Complex waveforms can be measured

Answers pg. 2

Mahoning Valley Amateur Radio Association - 2021 Membership

Date: _____

Name: _____ Call: _____

Spouse/Family : _____ Call: _____

Mailing Address _____

City: _____ State: ____ Zip: _____

Home Phone # _____ Cell # _____

Email: _____
(The MVARA Voice Coil, the club newsletter, will be emailed to this address)

ARRL member? □ ***Yes*** Expiration Month & Year _____ □ ***No***

Do you want the following to be included in the membership list available to all members?

Name and Call	□ *Yes*	□ *No*
Address	□ *Yes*	□ *No*
Phone	□ *Yes*	□ *No*
Email Address	□ *Yes*	□ *No*

Membership

□ *Renewal*	□ *New Member*	Single membership $20.00	$_____
□ *Renewal*	□ *New Member*	Additional family members, $10.00 each	$_____

W8QLY Repeater Support

$12.00	Basic Support Donation	$_____
$50.00	Gold Level Support Donation	$_____
$ _____	Other Support Donation	$_____

Total Enclosed $ _____

Make checks payable to: Mahoning Valley Amateur Radio Association

Please bring this form and your payment to the next meeting or mail to: MVARA, P.O. Box 14141, 125 West McKinley Way, Youngstown, Ohio 44514

Contest and Special Event Operating Information

Data below as well as more information courtesy of the following website:
http://www.hornucopia.com/contestcal/index.html

October 2020	
CWops Mini-CWT Test	0300Z-0400Z, Oct 1
NRAU 10m Activity Contest	1700Z-1800Z, Oct 1 (CW) and 1800Z-1900Z, Oct 1 (SSB) and 1900Z-2000Z, Oct 1 (FM) and 2000Z-2100Z, Oct 1 (Dig)
RTTYOPS Weeksprint	1700Z-1900Z, Oct 1
SARL 80m QSO Party	1700Z-2000Z, Oct 1
SKCC Sprint Europe	1900Z-2100Z, Oct 1
NCCC RTTY Sprint	0145Z-0215Z, Oct 2
NCCC Sprint	0230Z-0300Z, Oct 2
Portable Operations Challenge	0000Z, Oct 3 to 2359Z, Oct 4
TRC DX Contest	0600Z, Oct 3 to 1800Z, Oct 4
Oceania DX Contest, Phone	0600Z, Oct 3 to 0600Z, Oct 4
German Telegraphy Contest	0700Z-1000Z, Oct 3
Russian WW Digital Contest	1200Z, Oct 3 to 1159Z, Oct 4
IARU Region 1 UHF/Microwaves Contest	1400Z, Oct 3 to 1400Z, Oct 4
YLRL DX/NA YL Anniversary Contest	1400Z, Oct 3 to 0200Z, Oct 4
RTTYOPS Weekend Sprint	1600Z-1959Z, Oct 3
California QSO Party	1600Z, Oct 3 to 2200Z, Oct 4
International HELL-Contest	1600Z-1800Z, Oct 3 (80m) and 0900Z-1100Z, Oct 4 (40m)
FISTS Fall Slow Speed Sprint	1700Z-2100Z, Oct 3
SKCC QSO Party	1800Z, Oct 3 to 1800Z, Oct 4
RSGB DX Contest	0500Z-2300Z, Oct 4
UBA ON Contest, SSB	0600Z-0900Z, Oct 4
Peanut Power QRP Sprint	2200Z-2359Z, Oct 4
K1USN Slow Speed Test	0000Z-0100Z, Oct 5
RSGB 80m Autumn Series, CW	1900Z-2030Z, Oct 5
Worldwide Sideband Activity Contest	0100Z-0159Z, Oct 6
ARS Spartan Sprint	0100Z-0300Z, Oct 6
RTTYOPS Weeksprint	1700Z-1900Z, Oct 6
Phone Fray	0230Z-0300Z, Oct 7
CWops Mini-CWT Test	1300Z-1400Z, Oct 7
VHF-UHF FT8 Activity Contest	1700Z-2000Z, Oct 7
432 MHz Fall Sprint	1900 local - 2300 local, Oct 7
CWops Mini-CWT Test	1900Z-2000Z, Oct 7
UKEICC 80m Contest	2000Z-2100Z, Oct 7
CWops Mini-CWT Test	0300Z-0400Z, Oct 8
RTTYOPS Weeksprint	1700Z-1900Z, Oct 8
NCCC RTTY Sprint	0145Z-0215Z, Oct 9
NCCC Sprint	0230Z-0300Z, Oct 9
QRP ARCI Fall QSO Party	0000Z-2359Z, Oct 10
ARRL EME Contest	0000Z, Oct 10 to 2359Z, Oct 11
Makrothen RTTY Contest	0000Z-0800Z, Oct 10 and 1600Z-2400Z, Oct 10 and 0800Z-1600Z, Oct 11

10-10 Int. 10-10 Day Sprint	0001Z-2359Z, Oct 10
Nevada QSO Party	0300Z, Oct 10 to 2100Z, Oct 11
Oceania DX Contest, CW	0600Z, Oct 10 to 0600Z, Oct 11
Microwave Fall Sprint	0800 local - 1400 local, Oct 10
Scandinavian Activity Contest, SSB	1200Z, Oct 10 to 1200Z, Oct 11
SKCC Weekend Sprintathon	1200Z, Oct 10 to 2400Z, Oct 11
Arizona QSO Party	1500Z, Oct 10 to 0500Z, Oct 11
Cosack's Honor VHF/UHF Contest	1600Z, Oct 10 to 0400Z, Oct 11
Pennsylvania QSO Party	1600Z, Oct 10 to 0500Z, Oct 11 and 1300Z-2200Z, Oct 11
FISTS Fall Unlimited Sprint	1700Z-2100Z, Oct 10
South Dakota QSO Party	1800Z, Oct 10 to 1800Z, Oct 11
PODXS 070 Club 160m Great Pumpkin Sprint	2000Z, Oct 10 to 2000Z, Oct 11
UBA ON Contest, CW	0530Z-0800Z, Oct 11
UBA ON Contest, 6m	0800Z-1000Z, Oct 11
K1USN Slow Speed Test	0000Z-0100Z, Oct 12
4 States QRP Group Second Sunday Sprint	0000Z-0200Z, Oct 12
Worldwide Sideband Activity Contest	0100Z-0159Z, Oct 13
RTTYOPS Weeksprint	1700Z-1900Z, Oct 13
NAQCC CW Sprint	0030Z-0230Z, Oct 14
Phone Fray	0230Z-0300Z, Oct 14
CWops Mini-CWT Test	1300Z-1400Z, Oct 14
VHF-UHF FT8 Activity Contest	1700Z-2000Z, Oct 14
RSGB 80m Autumn Series, Data	1900Z-2030Z, Oct 14
AGCW Semi-Automatic Key Evening	1900Z-2030Z, Oct 14
CWops Mini-CWT Test	1900Z-2000Z, Oct 14
CWops Mini-CWT Test	0300Z-0400Z, Oct 15
RTTYOPS Weeksprint	1700Z-1900Z, Oct 15
NCCC RTTY Sprint	0145Z-0215Z, Oct 16
NCCC Sprint	0230Z-0300Z, Oct 16
Araucaria World Wide VHF Contest	0000Z, Oct 17 to 1600Z, Oct 18
JARTS WW RTTY Contest	0000Z, Oct 17 to 2400Z, Oct 18
10-10 Int. Fall Contest, CW	0001Z, Oct 17 to 2359Z, Oct 18
New York QSO Party	1400Z, Oct 17 to 0200Z, Oct 18
Stew Perry Topband Challenge	1500Z, Oct 17 to 1500Z, Oct 18
Worked All Germany Contest	1500Z, Oct 17 to 1459Z, Oct 18
Feld Hell Sprint	2000Z-2359Z, Oct 17
Argentina National 7 MHz Contest	2130Z-2230Z, Oct 17
Asia-Pacific Fall Sprint, CW	0000Z-0200Z, Oct 18
UBA ON Contest, 2m	0700Z-1000Z, Oct 18
Classic Exchange, Phone	1400Z, Oct 18 to 0800Z, Oct 19 and 1400Z, Oct 20 to 0800Z, Oct 21
Illinois QSO Party	1700Z, Oct 18 to 0100Z, Oct 19
RSGB RoLo CW	1900Z-2030Z, Oct 18
Run for the Bacon QRP Contest	2300Z, Oct 18 to 0100Z, Oct 19
K1USN Slow Speed Test	0000Z-0100Z, Oct 19
ARRL School Club Roundup	1300Z, Oct 19 to 2359Z, Oct 23
Telephone Pioneers QSO Party	1800Z-1900Z, Oct 19 (Digital Only) and 1900Z, Oct 19 to 0300Z, Oct 20 (All Modes)
RSGB FT4 Contest Series	1900Z-2030Z, Oct 19
Worldwide Sideband Activity Contest	0100Z-0159Z, Oct 20

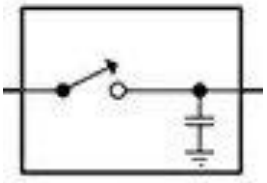
RTTYOPS Weeksprint	1700Z-1900Z, Oct 20
Phone Fray	0230Z-0300Z, Oct 21
CWops Mini-CWT Test	1300Z-1400Z, Oct 21
CWops Mini-CWT Test	1900Z-2000Z, Oct 21
CWops Mini-CWT Test	0300Z-0400Z, Oct 22
RTTYOPS Weeksprint	1700Z-1900Z, Oct 22
NCCC RTTY Sprint	0145Z-0215Z, Oct 23
NCCC Sprint	0230Z-0300Z, Oct 23
CQ Worldwide DX Contest, SSB	0000Z, Oct 24 to 2359Z, Oct 25
Kentucky State Parks on the Air	1400Z-2200Z, Oct 24
RTTYOPS Weekend Sprint	1600Z-1959Z, Oct 24
K1USN Slow Speed Test	0000Z-0100Z, Oct 26
QCX Challenge	1300Z-1400Z, Oct 26
QCX Challenge	1900Z-2000Z, Oct 26
Worldwide Sideband Activity Contest	0100Z-0159Z, Oct 27
QCX Challenge	0300Z-0400Z, Oct 27
RTTYOPS Weeksprint	1700Z-1900Z, Oct 27
SKCC Sprint	0000Z-0200Z, Oct 28
Phone Fray	0230Z-0300Z, Oct 28
CWops Mini-CWT Test	1300Z-1400Z, Oct 28
CWops Mini-CWT Test	1900Z-2000Z, Oct 28
UKEICC 80m Contest	2000Z-2100Z, Oct 28
CWops Mini-CWT Test	0300Z-0400Z, Oct 29
RTTYOPS Weeksprint	1700Z-1900Z, Oct 29
RSGB 80m Autumn Series, SSB	2000Z-2130Z, Oct 29
NCCC RTTY Sprint	0145Z-0215Z, Oct 30
NCCC Sprint	0230Z-0300Z, Oct 30
Zombie Shuffle	1600-2400 local, Oct 30
UK/EI DX Contest, SSB	1200Z, Oct 31 to 1200Z, Nov 1
Russian WW MultiMode Contest	1200Z, Oct 31 to 1159Z, Nov 1
RTTYOPS Weekend Sprint	1600Z-1959Z, Oct 31

What's a Few Artifacts Between Friends?

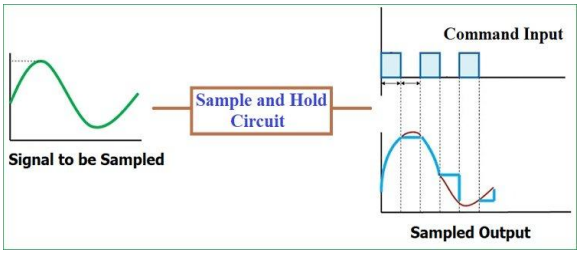
If you've investigated Digital Signal Processing, you probably have stumbled across the name Harry Nyquist. Born in Sweden in 1899, he emigrated to the US in 1907, and managed to get into the University of North Dakota in 1912. (If I was from Sweden, I would definitely make it a point to go somewhere warm and sunny like North Dakota!) Harry received bachelors and masters degrees in Electrical Engineering in 1914/1915 and transferred to Yale where he received a PhD in 1917. With his schooling finished Harry went on to work for AT&T at the Department of Development and Research from 1917 to 1934, and continued when it became Bell Telephone Laboratories that year, until his retirement in 1954. For those of you who were born after the breakup of AT&T, Bell Labs was the pinnacle of research in the Communications field. Over his career he was responsible for a number of breakthroughs in Communications, but the one we are dealing with now is in the area of Digital Sampling.

Digital Sampling is a step in how an Analog signal is converted into digital form. You can think of it as taking a snapshot of the Analog signal. Frequently this is accomplished with a circuit called a Sample and Hold circuit. The basics are that a switch controls the voltage getting to a capacitor, which charges to the peak value of the voltage while the switch is closed. If we close the switch for just a split second, the charge will represent the voltage in the input signal at that moment. Now if we do that over and over at a high rate, we have a series of samples that represent the changing voltage in the input.

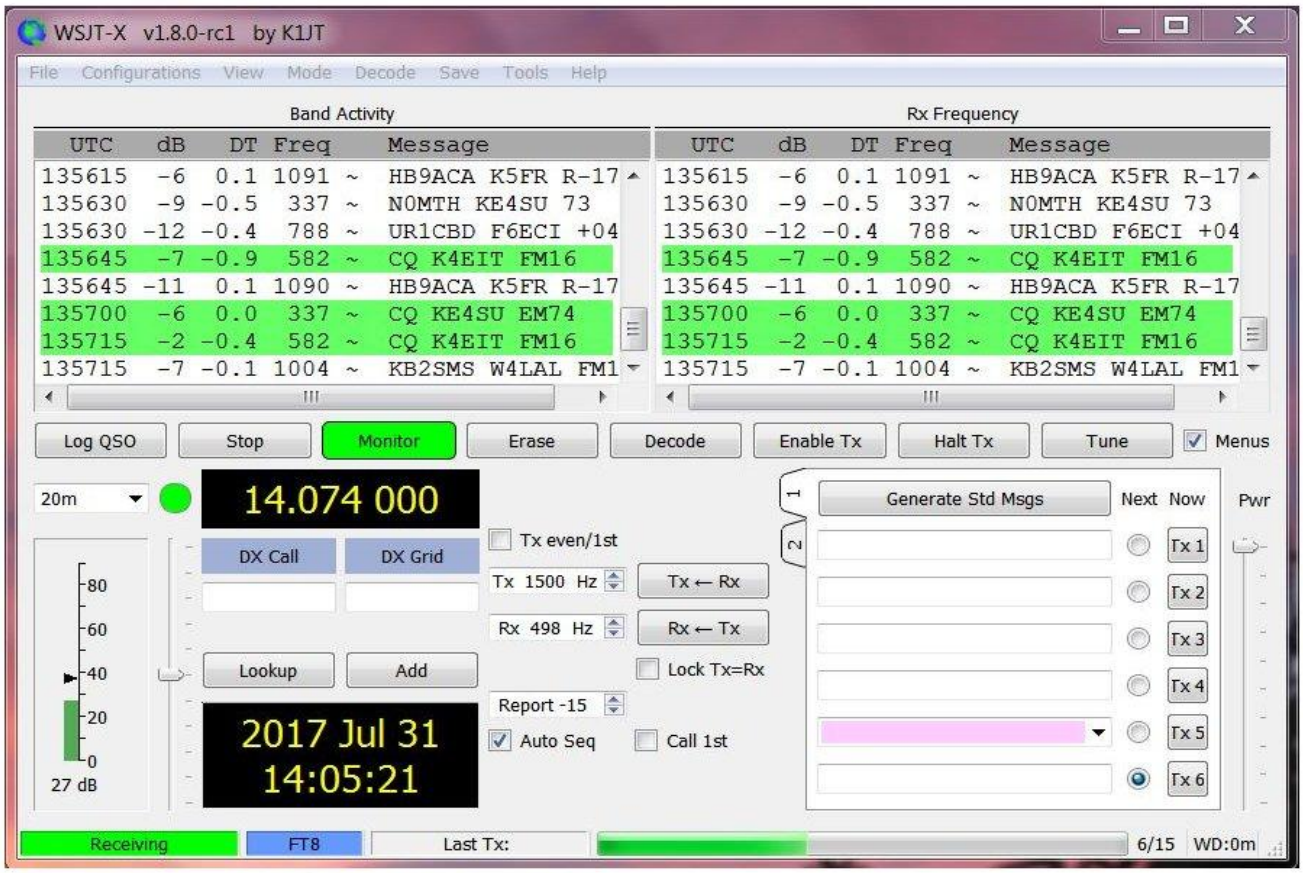
To finish up the process, the samples are sent to an A-D convertor that looks at each analog sample and converts it to a digital code that represents the peak value of the sample. For instance if we use four bit binary numbers and the sample at the moment is 7V, the A-D would write 0111, the binary for seven. Each of the binary numbers is then stored in memory.



What Harry did was investigate how fast he needed to do the samples to have an accurate translation into binary. If you only took one sample each minute, you would miss most of the signal before the next sample. During his research he discovered that we need to sample at a frequency of at least two times the highest frequency in the analog signal. For instance if you were trying to convert a 1Khz wave to digital, you need to sample at a 2Khz rate. You probably have run into this without knowing what it was. Like on a computer when setting up the sound card, there are different "rates" you can set for the card. Frequently the default value is 44.1Khz. Human hearing is usually specified as between 20Hz to 20Khz. If you double the highest frequency, 20Khz, you get 40 Khz. The sound card is sampling at the Nyquist rate.



Uh-Oh



The FT8 operations screen. A waterfall is displayed in a separate window.

CLOSE

Some of us enjoy using the FT-8 and FT-4 digital modes – there has been mention in QST that they are the fastest growing segments in Amateur Radio. If you are a FT-4/FT-8 user here is a tidbit from the Technical Coordinator at the West Central Florida ARES Section.

From: *David Birnbaum <dbirnbau@gmail.com>*
Date: *September 2, 2020 at 13:27:57 EDT*
To: *tarc hamclub <tarc@hamclub.org>*
Subject: [TARC] Note to WSJT-X users

If you use WSJT-X for FT8/FT4 contacts you should be aware that after every 15 second (7.5 sec for FT4) the program saves a copy of the received audio. Over time these files can amount to many GB of data that can fill up your hard drive and slow down your computer. This "feature" was originally intended to help diagnose program operations but isn't used very often anymore.

Unfortunately, there's no simple way to stop this saving process. However it is relatively easy to remove the files -- on the "File" drop down menu on the main WSJT-X screen there is an option to "remove all .wav and .c2 files from the .sav directory." Clicking on this will remove all the files stored there thus freeing up what is often a large amount of disk space.

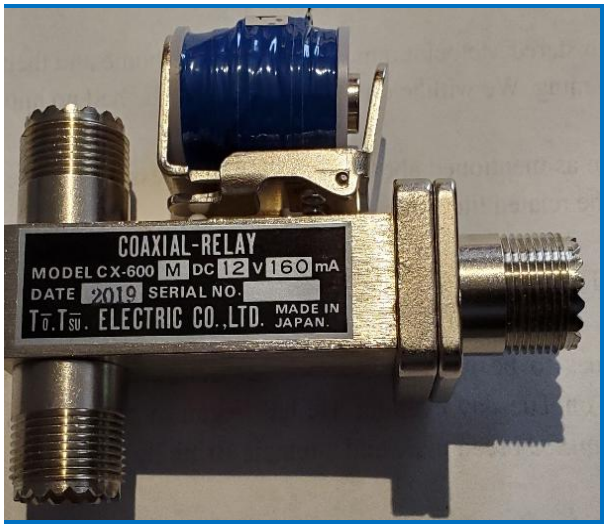
dave
k2lyv,
Tech Coordinator WCF Section

DC Device Control Over Coax Carrying RF Signals
A Bit About the "Bias Tee"

Andy Brincko WA8ZLK

I prefer not to run a separate pair of control wires out to where the new selector switch will be installed. Rather, I want to send the DC control voltage down the antenna's coaxial cable which is already installed. Doing this has some great advantages:

- The coax is there, so there is no need to pull additional wires
- The installed coax is designed for direct burial and therefore can stand up to the environment, and the outer insulation is UV resistant.
- The conductors in the coax are robust enough to handle the necessary dc voltage and current required to drive the relay coil.



COMPLEX SOLUTION?

Building or buying the bias tees may seem like a bit of extra work with added costs and simply running control wire out to the remote device would seem to be the easiest thing to do. At many QTH's that may be the case, but here at WA8ZLK access to the outdoors is at a premium and not convenient. My coaxial cables run through a crawl space with a low overhead, which is difficult for a near 70-year old to access. Avoiding the crawl space, I would have a long wire run to the remote relay and the wire would have to be heavy enough to not suffer significant voltage drop along that length of run. So, the bias tee is the way to go for me.

So, to put dc on the coax, some sort of a "Duplexer" circuit is needed to allow the desired mixing of DC and RF signals on the coax. Enter the "Bias Tee", a nifty little gadget (Fig-1) that allows us to do just what we want to do here.

THE CIRCUITS:

The bias tee is a simple **L**-shaped LC network having a capacitor and an inductor, each strategically connected to block DC on one hand and RF on the other. In operation, the control DC is passed to the center conductor of the coax through the inductor "**L**" here acting as an rf choke. The DC is blocked from going back into the radio by the capacitor **C**, connected in series with the coaxial cable's center conductor. The inductor is sized to block rf from getting into the DC power supply while the capacitor is sized to have a low impedance to the rf signals that are to be passed to the antenna. More on component sizing follows later.

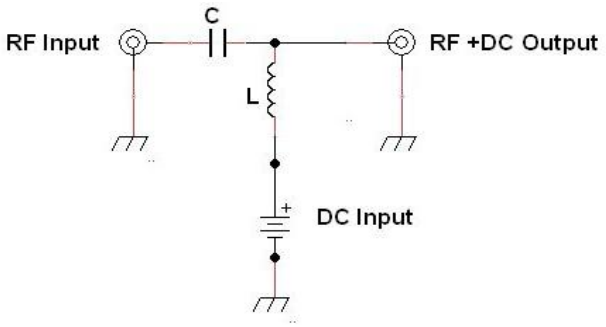


Figure-1 Injector Bias Tee

As described, this bias tee allows us to "inject" the control DC signal onto the coaxial cable, but once we get to the antenna switch's location we will need to "extract" the DC from the coax so that it can be applied to the relay coil. So, how do we do this?

Employing a second bias tee as the "extractor" does the trick, but we must move the capacitor to the output leg or antenna connecting leg of the LC network. We want the DC to be available to our coaxial switch and not be presented to the antenna. The extracting bias tee can be thought of schematically as the mirror image of the injecting bias tee. See Figure-2.

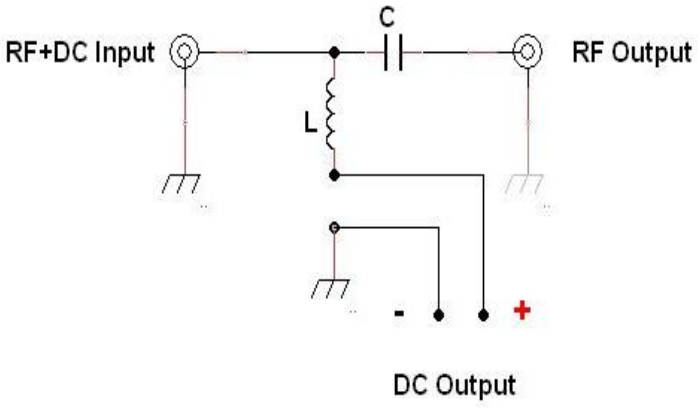


Figure-2 Extractor Bias Tee

COMPONENT SIZING:

Now, you cannot use just any inductor "**L**" or Capacitor "**C**". The capacitor must be sized ***to pass*** rf signals at the lowest frequency of interest, while the inductor must be sized ***to block*** rf at the lowest frequency of interest. Therefore, the capacitor must have a small reactance at the lowest frequency you want to pass to your antenna. Conversely the inductor's reactance must be quite high at this lowest frequency.

We worry only about the lowest frequencies for our design due to the nature (i.e. the physics) of capacitive and inductive reactance. Due to the physics of these components the effectiveness of the bias tee improves as the applied frequency is increased. Let us take a brief look at this.

First, we will look at the Capacitive reactance which is defined as: $x_C = \frac{1}{\omega C} = \frac{1}{2\pi f C}$

Where:
X_c = Capacitive reactance in ohms
f = frequency in Hz
C = Capacitance in farads

Note, in the above equation; as the denominator of the right side of the equation gets larger, X_c on the left side gets smaller. So, as frequency increases, X_c decreases thereby reducing the opposition to the applied rf. Furthermore, we want a good size value of **C** to start with to make X_c low at the lowest frequency of interest for amateur use; for this discussion let us say 1.8 MHz, i.e. the bottom end of the 160 meter band.

Next, we examine Inductive reactance**:** $x_L = \omega L = 2\pi f L$

Where:
X_L = Inductive reactance in ohms
f = frequency in Hz
L = Inductance in henries

Note that X_L increases as f and L increase. Here we want to have X_L as large as possible at 1.8 MHz, to keep as much of the applied RF signal from getting

Radian Frequency: Notice that, "2πf" appears in both above equations. 2πf = **ω** or the **radian frequency** of the applied signal and is represented by the lower-case Greek letter Omega (ω). Radian frequency stems from the fact that AC waveforms are often generated by rotating machines and can always be analyzed using a rotating vector (even when the generator is not a rotating machine). As the rotating vector spins faster the frequency **f** expressed in Hz increases. Remember too, that a **vector** is a quantity, that to be fully defined, **must be specified by two numbers** i.e. a magnitude and a direction. A quantity that can be defined by a single number is called a **scalar**.

back into our DC power source. Bias tee performance gets better as we go to 80, 40, 20 meters etc.

One other consideration with respect to **L** must be noted. The wire from which the inductor is wound needs to be of a large enough wire gauge to handle the load current drawn by the device being controlled. In this case, my relay coil. Note: Any dc operated device hung out remotely can be powered and controlled with a "bias tee", preamplifiers and remote antenna tuners quickly come to mind, but remember the wire from which the inductor is wound, must be able to handle the electrical current that will be drawn by the remote device.

Also note, the LC network will have, somewhere, a natural resonant frequency, f_o. This frequency wants to be far removed from any amateur operating frequency and is given by the following equation:

$$f_o = \frac{1}{2\pi\sqrt{LC}}$$

Where:
f_o = resonant frequency in Hz.
L = inductance in Henries
C = Capacitance in farads

Finally remember, the inductor "**L**" will also have a self-resonant frequency due to its inter-turn capacitance. This is usually not a worry for operation in the HF spectrum since this value of capacitance is usually quite small, pushing the self-resonant frequency up into the VHF or perhaps even into the UHF spectrum. It is, however, something to consider for bias tees designed for theses higher frequencies.

HELP WITH CALCULATIONS:

To help with component selection for my bias tee, I worked up an Excel spreadsheet. With this spreadsheet I was able to see the "what ifs" for any components I might choose. The spreadsheet allows me to input the value of a Capacitor, and an Inductor in common units such as mH, µF etc., it then converts these to the base units of henries and farads. The spreadsheet then calculates the X_L and X_c at the bottom frequency of each amateur band from 160 through 6 meters. X_L and X_c are reported both in scientific and decimal notation. The sheet also calculates the impedance Z_o of the LC network at the bottom frequency of each band. Finally, the series resonant frequency f_o of the LC network is calculated and reported.

2π = 6.2832	BAND									
	160 m	80 m	40 m	30 m	20m	17 m	15 m	12m	10 m	6 m
Frequency f in Hz (@ low end of band) =	1,800 kHz	3,500 kHz	7,000 kHz	10.1 Mhz	14.0 MHz	18.068 MHz	21.0 MHz	24.89 MHz	28.00 MHz	50.0 MHz
L (henries) =	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03	1.00E-03
C (farads) =	7.50E-07	7.50E-07	7.50E-07	7.50E-07	7.50E-07	7.50E-07	7.50E-07	7.50E-07	7.50E-07	7.50E-07
X_L (ohms) =	1.13E+04	2.20E+04	4.40E+04	6.35E+04	8.80E+04	1.14E+05	1.32E+05	1.56E+05	1.76E+05	3.14E+05
X_L (ohms) =	11,310	21,991	43,982	63,460	87,965	113,525	131,947	156,388	175,929	314,159
X_c (ohms) =	117.9E-3	60.6E-3	30.3E-3	21.0E-3	15.2E-3	11.7E-3	10.1E-3	8.5E-3	7.6E-3	4.2E-3
X_c (ohms) =	0.1179	0.0606	0.0303	0.0210	0.0152	0.0117	0.0101	0.0085	0.0076	0.0042
Impedance Z (ohms) at low end of band =	11,310	21,991	43,982	63,460	87,965	113,525	131,947	156,388	175,929	314,159

LC Circuit's f_o = 5.812 kHz ← Series Resonant Frequency of LC Network*

*Note: f_o must not lie in any amateur band; in fact f_o in the audio range is ideal.

only the calculated results for a bias tee using a 0.75 ***μF*** capacitor and a 1.0 ***mH*** inductor. Note that $\boldsymbol{X_L}$ increases with frequency as $\mathbf{X_c}$ decreases. Note also that the natural resonant frequency of the LC network using these two component values is at 5.812 kHz. That is in the audio range above the filter bandwidth (usually 2.5 to 3 kHz) for SSB voice, and is surely well removed from any amateur frequency, so we are good there.

One final note regarding the capacitor, the voltage rating of the Capacitor **C** should be high, 500 V or better. A 1 kV to 1.2 kV rating is even more comfortable.

COMPONENT AVAILABILITY:

I was able to obtain two (2), 1mH rf chokes from RF Parts Inc, in California, the same source from which I obtained the single pole double throw (SPDT) coaxial relay. Interestingly, these were "NEW OLD STOCK" having been packaged by National Radio Corporation in the 1950's for the military. They were vacuum sealed in foil pouches. Very cool!

Now, I only need to obtain a couple small enclosures, a couple 0.75 or 1.0 μF 1 kV capacitors and a few SO-239 chassis mount connectors, to build the bias tees discussed above. Then I can install my remotely controlled antenna selector relay.

FYI: The circuit diagrams included herein were drawn in **Tiny Cad**, a free computer-aided drafting program specially designed for electrical drafting. If you have need for a capable, simple to learn and use, electrical drafting program, "Google" Tiny Cad and get yourself a copy.

If anyone would like a copy of my spreadsheet, they can drop me a line at ajaybee92@gmail.com and I'll send a copy via return e-mail.

73 de Andy WA8ZLK

HF Station Grounding and Microcontroller Projects are Next ARRL Webinar Topics

Two well-known ham radio authors and speakers will share their expertise with members in October during **ARRL Learning Network** webinars.

- ARRL Contributing Editor Ward Silver, N0AX, will present "Grounding & Bonding for Home HF Stations" on Tuesday, October 6, at 10 AM PDT/1 PM EDT/0500 UTC.
- Popular ARRL author Glen Popiel, KW5GP, will present "Welcome to the World of Arduino" on Thursday, October 15, at 5 PM PDT/8 PM EDT (0000 UTC on Friday, October 16). Members must log in to the ARRL website to register for each webinar.
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Silver authored the ARRL book ***Grounding and Bonding for the Radio Amateur*** in 2017 as a practical guide to building a station that incorporates effective grounding and bonding techniques for electrical safety, lightning protection, and RF management. Radio amateurs often cite the title for demystifying an often misunderstood or intimidating topic.
During his webinar, Silver will define grounding and bonding, cover the benefits and requirements, and share useful references and guides for hams to apply these techniques in their home HF stations.

In his presentation, Popiel — the author of several ARRL books, including *Arduino for Ham Radio,* ***More Arduino Projects for Ham Radio***, and ***High Speed Multimedia for Amateur Radio*** — will cover the open-source, electronic-prototyping Arduino platform, which is widely popular among electronics hobbyists and radio amateurs. The webinar will include examples of how to put Arduinos to use in building ham radio projects and practical station gear.

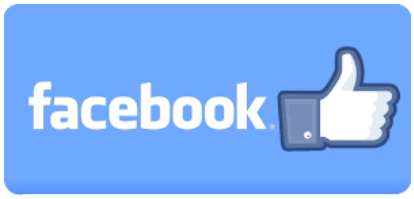
Live question-and-answer periods will follow each 30-minute presentation.

The ARRL **Learning Network** webinar series was introduced as a new membership benefit in July. Presentations are by members, for members, as part of ARRL's Lifelong Learning initiative. Topics cover three primary interest areas among radio amateurs, including electronics and technology, personal communications and operating, and emergency communications and public service.

All webinars are recorded, so members and radio clubs can view previous presentations. ***Join*** *ARRL to take advantage of this new member benefit.*

The Last Word

"Voting is the expression of our commitment to ourselves, one another, this country, and this world." ***Sharon Salzberg***



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MVARAVoiceCoil@gmail.com

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